Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	
Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996	CC Docket 98-146

COMMENTS OF TELEDESIC LLC

Teledesic LLC is pleased to submit its comments in response to the Commission's Notice of Inquiry ("NOI") addressing advanced telecommunications services. Teledesic has been licensed to build the world's first high-capacity broadband non-geostationary ("NGSO") satellite network in the Fixed Satellite Service ("FSS").[1] In these comments we describe the truly revolutionary potential of NGSO FSS systems, and suggest regulatory steps the Commission can take to promote the speedy and successful deployment of NGSO FSS and other types of broadband wireless technologies.

Congress has called on the Commission to encourage the "deployment on a reasonable and timely basis of advanced telecommunications capability to all Americans."[2] Teledesic

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1 *Teledesic Corp.*, 12 F.C.C. Rcd. 3154 (Int'l Bur. 1997). The *NOI* references the Teledesic license at ¶ 46 n.45.

2 Pub.L. 104-104, Title VII, § 706, *codified at* 47 U.S.C. § 157 note.

applauds the Commission on its first step in this process. The comprehensive NOI to which these comments respond identifies many of technical and regulatory issues involved in bringing advanced broadband services to market. Among other things, the NOI asked commenters to supply information on planned satellite broadband systems, and to suggest regulatory reforms that would hasten the deployment of broadband satellite networks.[3] Accordingly, these comments are divided into two sections. First, we describe the special capabilities of the Teledesic Network. This system represents a new type of satellite technology that combines the global coverage and low latency of a low-Earth orbit (LEO) constellation of satellites with the flexibility of the Internet and "fiber-like" transmission quality. It will be capable of providing broadband services such as Internet access, videoconferencing, interactive multimedia, and real-time, two-way digital data everywhere in the United States and around the world. In the second section of these comments, we describe regulatory steps the Commission can take to promote the rapid deployment of NGSO FSS *and* other forms of broadband wireless technologies. In particular, we suggest that the Commission would promote "the deployment . . . of advanced telecommunications capability to all Americans" by expediting regulatory approvals, segmenting the 18 GHz band among satellite and terrestrial providers, and by adopting "blanket licensing"[4] rules for fixed satellite providers in that band.

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[3] *NOI*, at ¶ 46.

[4] Under a blanket licensing regime, licensees receive authorization from the Commission to operate a large number of receiving and/or transmitting stations without the need to coordinate each station with other users of the spectrum. Blanket licensing rules are in place, for example, for satellite networks deploying Very Small Aperture Terminals ("VSAT"). *See*, 47 C.F.R. § 25.134.

I. THE BENEFITS OF NGSO FSS AND THE TELEDESIC NETWORK

As information becomes increasingly essential to all those things we associate with quality of life — economic development, education, health care, public services — societies around the world must ensure that they have access to advanced telecommunications infrastructure. As the Commission has recognized, advanced telecommunications capability and services can help "create a more productive, knowledgeable, and cohesive nation."[5] *It is therefore in the public interest to develop regulatory policies that will allow NGSO systems to provide service throughout the United States.*

In the coming years, much of the world's need for broadband capacity will be satisfied by networks connected with fiber optic cable. Fiber optics provide the reliable and low-latency digital connections required for interactive broadband communications. This functionality largely explains why so much has been invested over the past several years installing both domestic and international fiber networks. But while a great deal of fiber has been laid, it is used primarily along international routes and to connect telephone company central offices. Wiring the "last mile" — even in urban areas — is extraordinarily expensive.

Wireless technologies offer a solution to the "last mile" problem. The cost of accessing wireless services is largely indifferent to location. This is especially true for satellite services, which can cover vast regions without the need to install terrestrial transmitting equipment. Historically, however, satellites have not been effective at supporting interactive broadband communications, because satellite services have historically been provided primarily by satellites in geostationary orbit ("GSO"). GSO satellites orbit the Earth at an altitude of approximately

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[5] *NOI*, at ¶ 1.

36,000 kilometers. Even at the speed of light, a round-trip communication through a GSO satellite entails a transmission delay or latency of approximately half a second. This is many times longer than the transmission delay over fiber optic cable, and does not adequately support interactive broadband.

The new NGSO FSS systems can avoid the latency problems that plague GSO satellites. They will have such capability because they orbit at a low altitude — the Teledesic Network, for example, will operate in low Earth orbit 25 times closer to the Earth than GSOs. The Teledesic Network will therefore combine the low latency connections characteristic of fiber optic networks with the flexibility of satellite service.

Moreover, because NGSO FSS satellites move in relation to the Earth's surface — rather than remaining fixed above one point on the globe — they provide even more flexibility than do traditional geostationary satellite networks. The Teledesic Network is designed such that continuous coverage of any one point on Earth requires, essentially, continuous coverage of *all* points on Earth. It will not be more costly for the Teledesic Network to service traditionally hard to reach regions than it will be to serve the most advanced urban centers. This fact radically changes the economics of telecommunications infrastructure. Every region — rural and urban, rich and poor — will have access to the same high-quality broadband service. The Teledesic Network will provide universal coverage that need not be mandated by regulation or legislation. Rather, it is inherent in the nature of the technology that traditionally under-served regions of the country and the world receive the same level and quantity of service as the most developed.

In enacting Section 706 of the Communications Act, Congress recognized the importance of extending the principle of universal access to advanced broadband services. The Teledesic Network will further this congressional goal. From day one of operation, it will be capable of

providing broadband coverage to every part of every state and territory of the United States. The service quality will be comparable to fiber. Unlike other licensed LEO systems which will provide the satellite equivalent of paging and wireless phone service, Teledesic will provide true broadband service. Bandwidth will be provided "on demand" as required by the user at data rates of up to 64 Mbps on the downlink and 2 Mbps on the uplink. Error rates will be very low, and availability near 100 per cent. Additionally, Teledesic expects rates to be comparable to those of future urban wireline services for broadband access.

The Teledesic Network will complement fiber networks where they exist, and provide an alternative in areas that lack fiber coverage. In addition, the Teledesic Network will be compatible with fiber wireline and terrestrial wireless systems, and it will seamlessly interconnect with the public switched telephone network ("PSTN"). Teledesic has designed its system to be capable of running advanced applications and protocols devised for terrestrial networks. Since user terminals perform a translation between the Teledesic Network's internal protocols and the standard protocols of the terrestrial world, the satellite network (which is difficult to change given that it will be in orbit) need not be altered to deal with complexity and change. Hence, Teledesic will support the protocols of fiber networks — such as TCP/IP, ISDN, ATM — and will be capable of adapting to new protocols as they are developed.

II. REGULATORY RECOMMENDATIONS

Two fundamental components of assuring the availability of this promising service are streamlined regulation and effective spectrum planning. In particular, the Commission should strive to expedite the regulatory approval process. In the past, it was believed that only

governments had the financial resources necessary to successfully deploy satellite systems. Over the past decade especially, commercial entities have demonstrated their ability to raise the necessary funds, and to convert what had been a government subsidized service into a successful and competitive industry. But gathering the resources to construct, launch, and operate these systems — especially a constellation as sophisticated as the Teledesic Network — remains a monumental undertaking. The Commission advances the effort and therefore promotes the public interest by eliminating regulatory hurdles when possible, and by acting expeditiously on applications and other requests pending before it. Due to the unusually long lag time between licensing and launch, NGSO FSS operators in particular will require multiple Commission approvals before even launching their systems. As technology and circumstances evolve, NGSO FSS system parameters are likely to change, requiring operators to request alterations to their FCC authorizations. By acting as quickly as possible on these necessary requests, the Commission creates a stable regulatory environment and thereby promotes investment in satellite services.

A second fundamental component of effective satellite regulation is frequency band segmentation. If an effective spectrum plan is implemented, NGSO FSS systems can provide broadband service throughout the United States, while at the same time avoiding interference with GSO systems, with terrestrial services, and with each other. NGSO systems, due to their global nature, require the use of *the same* paired uplink and downlink spectrum *internationally*. Recognizing this fact, the 1997 World Radiocommunication Conference (WRC-97) with the support of the United States finalized the designation of 18.8-19.3 GHz and 28.6-29.1 GHz for international use by NGSO FSS ("paired 500 MHz bands"). In every other FSS band, NGSO systems are required by the ITU's Radio Regulations to protect all current *and future* GSO

systems. In the paired 500 MHz bands, however, an NGSO FSS system may operate without the threat that its service area or quality of service will be limited by a later-authorized GSO system. Since these bands are currently free of significantly interfering systems in most regions of the world, they represent the best opportunity for NGSO FSS systems to realize the full potential of global broadband service.

The key to securing the benefits of each and all of the emerging technologies that have been proposed for the Ka band (17.7–20.2 GHz and 27.5-30.0 GHz), of which the paired 500 MHz bands are a part, is careful coordination and planning of the band. This was a central conclusion in the proceeding in which the Commission segmented the 28 GHz band among NGSO FSS, GSO FSS, LMDS, and MSS feeder links.[6] Unfortunately, there is still work to be done at 18 GHz, because fixed-satellite and fixed-terrestrial operators still must attempt to operate co-frequency in portions of the band. Teledesic urges the Commission to endorse band segmentation and "blanket licensing" of the 18 GHz band. Doing so will significantly promote the "deployment on a reasonable and timely basis of advanced telecommunications to all Americans."

Sharing Between NGSO FSS and the Fixed Services

Historically, satellite and terrestrial services have been able to share the same frequencies without difficulty. Both services were used primarily for trunking applications, so coordination involved a relatively small number of large, expensive terrestrial links and a relatively small

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[6] Rulemaking to Amend Parts 1, 2, 21, and 25 of the Commission's Rules to Redesignate the 27.5-29.5 GHz Frequency Band, to Reallocate the 29.5-30.0 GHz Frequency Band, to Establish Rules and Policies for Local Multipoint Distribution Service and for Fixed Satellite Services, *First Report and Order and Fourth Notice of Proposed Rulemaking*, 11 F.C.C. Rcd. 19005 (1996).

number of large, expensive satellite earth stations. This was not unduly burdensome for either service. As technological development has facilitated the use of higher frequencies, however, this traditional sharing paradigm has broken down. The propagation characteristics of the frequencies where the Teledesic Network will operate permit both satellite and terrestrial operators to use much smaller antennas, and consequently both can tailor their service offerings to a much larger class of end users. In other words, technology now allows for "ubiquitous deployment."

Ubiquitous deployment allows satellite and terrestrial providers to offer "last mile" broadband service, so long as the spectrum is carefully regulated. A problem arises because ubiquitous deployment makes co-frequency operation more difficult. Fixed Service ("FS") stations impose regions around each FS transmitter in which NGSO user terminals cannot be reliably operated due to FS interference into NGSO terminals. These blocked regions are referred to as "exclusion zones." A single point-to-point FS transmitter will typically create a circular exclusion zone in the area immediately surrounding it and a highly elliptical exclusion zone extending a long distance in its direction of transmission. In the case of a typical FS transmitter employing a 0.6 m antenna in the 18 GHz band, the diameter of the exclusion zone around the terminal can be nearly 1 km and the length of the exclusion zone in the direction of transmission can be well over 45 km. The total exclusion zone area for just one of these typical FS transmitters is more than 50 km^2.

If NGSO and FS networks were to be operated in the same spectrum, the benefits of ubiquitous deployment would be lost and severe restrictions would apply to the placement of user terminals for both services. Frequency coordination of individual terminal locations would be required which could create costly delays in the issuance of site licenses for both NGSO and

FS systems. Significant resources would be required from the FCC, the NGSO operators, and the FS operators to administer and participate in the necessary coordination proceedings. Furthermore, when NGSO customers move to new locations, coordination proceedings would need to be reinitiated — potentially resulting in an existing user not being able to obtain service in the new location. For all these reasons, a band segmentation solution with blanket licensing within each segment makes the most effective use of the spectrum. Specifically, we recommend that the 18.8 -19.3 GHz frequency bands be reserved for NGSO FSS use and that FS systems be authorized in other portions of the 18 GHz band. This solution would allow all of the services to flourish, thereby enhancing the development of this nation's broadband infrastructure

IV. CONCLUSION

Congress and the Commission have together recognized that advanced broadband networks promise to bring enormous benefits to American society. There is no doubt that broadband wireless systems — both terrestrial and satellite — will be an important component of that infrastructure in the coming years. The Teledesic Network in particular will offer high-speed services of every kind, and will have the capability and the capacity to provide those services to all locations in the United States (and almost everywhere in the world).

One of the most important steps the Commission can take to promote the development of advanced broadband networks it to segment frequency bands between terrestrial and satellite services when those services will be ubiquitously deployed. The 18 GHz band is currently an issue of significant concern. In the interest of facilitating the optimal deployment of NGSO FSS, GSO FSS, MSS feeder links, and the FS, the Commission should act quickly to segment the band and allow for blanket licensing.

Teledesic thanks the Commission for taking the time to carefully consider both the promise and pitfalls associated with regulating advanced communications networks. We look forward to working together with the Commission, the public, and other service providers to transform Congress's aspirations, as expressed in Section 706, into a reality.

Respectfully submitted,

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